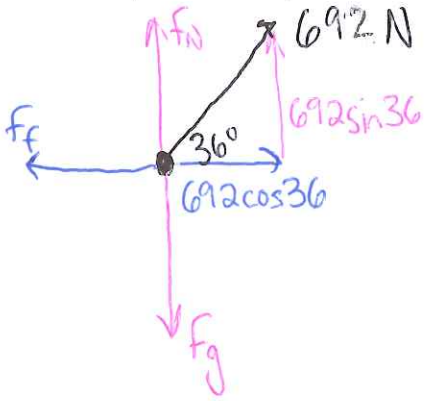
Name: KEY Period: _____ Date: _____

Miss Brienza

Honors Physics

Forces Extra Practice Problems

1. Ben Laborin works for the South bookstore during the summer months to help prepare for Fall sales. Books from one supplier are shipped to the school in large crates equipped with rope handles on all sides. On one occasion, Ben momentarily pulled with a force of 692 N at an angle of 36.0° above the horizontal to accelerate a 112-kg crate of books. The coefficient of friction between the crates and the vinyl floor is 0.548. Determine the acceleration experienced by the crate.



$\Sigma f_x = 692\cos 36 - f_f = ma$

$692\cos 36 - \mu f_N = ma$

$\Sigma f_y = 692\sin 36 + f_N - f_g = 0$

$692\sin 36 + f_N - 112(9.8) = 0$

$f_N = 690.853\,N$

$692\cos 36 - .548(690.852) = 112a$

$\boxed{a = 1.62\ m/s^2}$

2. A motorcyclist is coasting with the engine off at a steady speed of 17 m/s but enters a sandy stretch where the coefficient of friction is 0.80. Will the cyclist emerge from the sandy stretch without having to start the engine if the lasts for 20 m? If so, what will be the speed upon emerging?

$V_i = 17\ m/s$

$V_f = 0\ m/s$

$a = -7.84\ m/s^2$

$\Delta x = ?$

$\Sigma F = -f_f = ma$

$-\mu f_N = ma$

$-\mu mg = ma$

$-.8(9.8) = a \rightarrow a = 7.84\ m/s^2$

$V_f^2 = V_i^2 + 2a\Delta x$

$0 = 17^2 + 2(-7.84)\Delta x$

$\Delta x = 18.43\,m$

SO NO HE WILL NOT MAKE IT!

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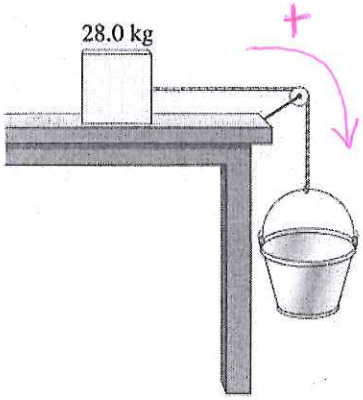


FIGURE 4-57

3. A 28.0-kg block is connected to an empty 1.00-kg bucket by a cord running over a frictionless pulley (Fig. 4-57). The coefficient of static friction between the table and the block is 0.450 and the coefficient of kinetic friction between the table and the block is 0.320. Sand is gradually added to the bucket until the system just begins to move. (a) Calculate the mass of the sand added to the bucket. (b) Calculate the acceleration of the system.

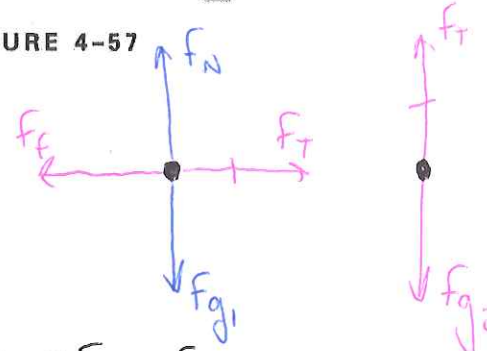
a. $\Sigma F_{SYSTEM} = -f_{fr} + \cancel{f_T} - \cancel{f_T} + f_{g_2} = 0$

$-\mu_s f_N + (m_{BUCKET} + m_{sand})g = 0$

$-\mu_s m_{BLOCK} g + (m_{BUCKET} + m_{sand})g = 0$

$-.450(28)(9.8) + (1 + m_{sand})9.8 = 0$

$m_{sand} = 11.6\ kg$



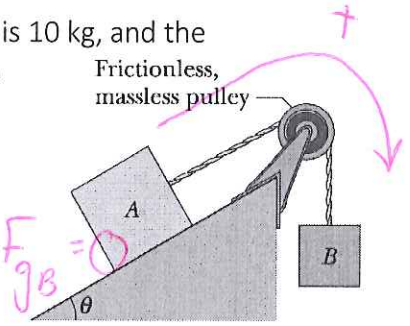
b. $-f_{fr} + f_{g_2} = m_{TOTAL}\, a$

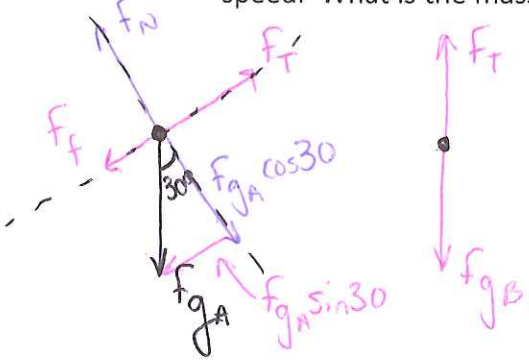
$-\mu_K f_N + f_{g_2} = m_{TOTAL}\, a$

$-.32(28)(9.8) + 12.6(9.8) = (28 + 12.6)a$

$a = .878\ m/s^2$

4. In the figure, two blocks are connected over a pulley. The mass of block A is 10 kg, and the coefficient of kinetic friction between A and the incline is 0.20. The incline is angled at 30degrees. Block A slides down the incline at a constant speed. What is the mass of block B?





$\Sigma F = -f_f - f_{g_A}\sin 30 + \cancel{f_T} - \cancel{f_T} + f_{g_B} = 0$

$-\mu f_N - f_{g_A}\sin 30 + f_{g_B} = 0$

$-\mu f_{g_A}\cos 30 - f_{g_A}\sin 30 + f_{g_B} = 0$

$-\mu m_A \cancel{g}\cos 30 - m_A \cancel{g}\sin 30 + m_B \cancel{g} = 0$

$-.2(10)\cos 30 - 10\sin 30 + m_B = 0$

$\therefore\ m_B = 6.732\ kg$